2022

B.A./B.Sc.

Fourth Semester

GENERIC ELECTIVE – 4

CHEMISTRY

Course Code: CHG 4.11

(Physical Chemistry for Biosciences)

Total Mark: 70   *Pass Mark: 28*

Time: 3 hours

Answer <u>five</u> *questions, taking* <u>one</u> *from each unit.*

UNIT–I

1. (a) Derive Kirchhoff's equation. 5
   (b) Explain third law of thermodynamics in terms of absolute entropy calculation. 5
   (c) Define the following terms with supporting equations: 2+2=4
      (i) Standard enthalpy of formation
      (ii) Enthalpy of reaction

2. (a) Explain the term bond energy and its importance in thermochemical reactions with suitable examples. 4
   (b) Write short notes on the following: 2×3=6
      (i) Enthalpy of solution
      (ii) Integrated enthalpy   (iii) Standard state
   (c) How can you calculate bond dissociation energy and resonance energy from thermochemical data. 4

UNIT–II

3. (a) Derive the relationship among Kp, Kc and Kn for a reaction. 5
   (b) Differentiate the terms ΔG and ΔG° with mathematical expressions. 4
   (c) Explain Le Chatelier's principle and its application in thermal equilibrium w.r.t. $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2\,NH_{3(g)}; -\Delta H$ 5

4. (a) Derive the integrated rate expression for 1st order reaction. 4
   (b) Write short notes on the following: 2×3=6
       (i) Zero order reaction
       (ii) Half-life period   (iii) Arrhenius equation
   (c) Differentiate the terms order and molecularity with relevant examples.
       4

UNIT–III

5. (a) What are the factors affecting degree of ionization of an electrolyte.
       3
   (b) Distinguish the following terms with suitable examples. 2×2=4
       (i) Strong and weak electrolytes
       (ii) Acids and bases
   (c) What is ionization constant. 2
   (d) Explain the term solubility product and its application. 5

6. (a) What is buffer solution? Explain its application in food industry. 4
   (b) Derive the expression for ionic product of water. 4
   (c) Write short notes on following terms: 2×3=6
       (i) Degree of hydrolysis and applications
       (ii) Common ion effect and applications

UNIT–IV

7. (a) Explain the following terms with suitable examples: 3×3=9
       (i) Azeotropes
       (ii) Eutectic mixture   (iii) Nernst distributer law
   (b) Derive the Gibbs phase rule. 5

8. (a) Write short essays on the following with supporting diagrams:
       (i) One component system-sulphur system 5×2=10
       (ii) Pb-Ag system
   (b) Explain the following terms: 2×2=4
       (i) Desilverisation of Pb
       (ii) Metastable equilibrium

UNIT–V

9. (a) What are the postulates and limitations of Arrhenius theory of electrolytic dissociation?   5

(b) Write a note on variation of specific conductance with dilution.   3

(c) Write short notes on the following: 2×3=6

   (i) Kohlrausch's law

   (ii) Transport number   (iii) Equivalent conductance

10. (a) What are the differences between photochemical and thermochemical reactions? Explain in detail.   4

(b) What are the various laws of photochemistry.   4

(c) What is quantum yield? What are the reasons for low and high quantum yield?   4

(d) Distinguish the terms phosphorescence and fluorescence.   2

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